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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

FOREST INSECT INVESTIGATIONS

REPORT OF PINE BEETLE SURVEYS on the WENATCHEE NATIONAL FOREST, WASHINGTON 1931 - 1938

By
J. M. Whiteside
Assistant Entomologist
Bureau of Entomology and Plant Quarantine
December 1938

Forest Insect Laboratory
445 U. S. Court House
Portland, Oregon

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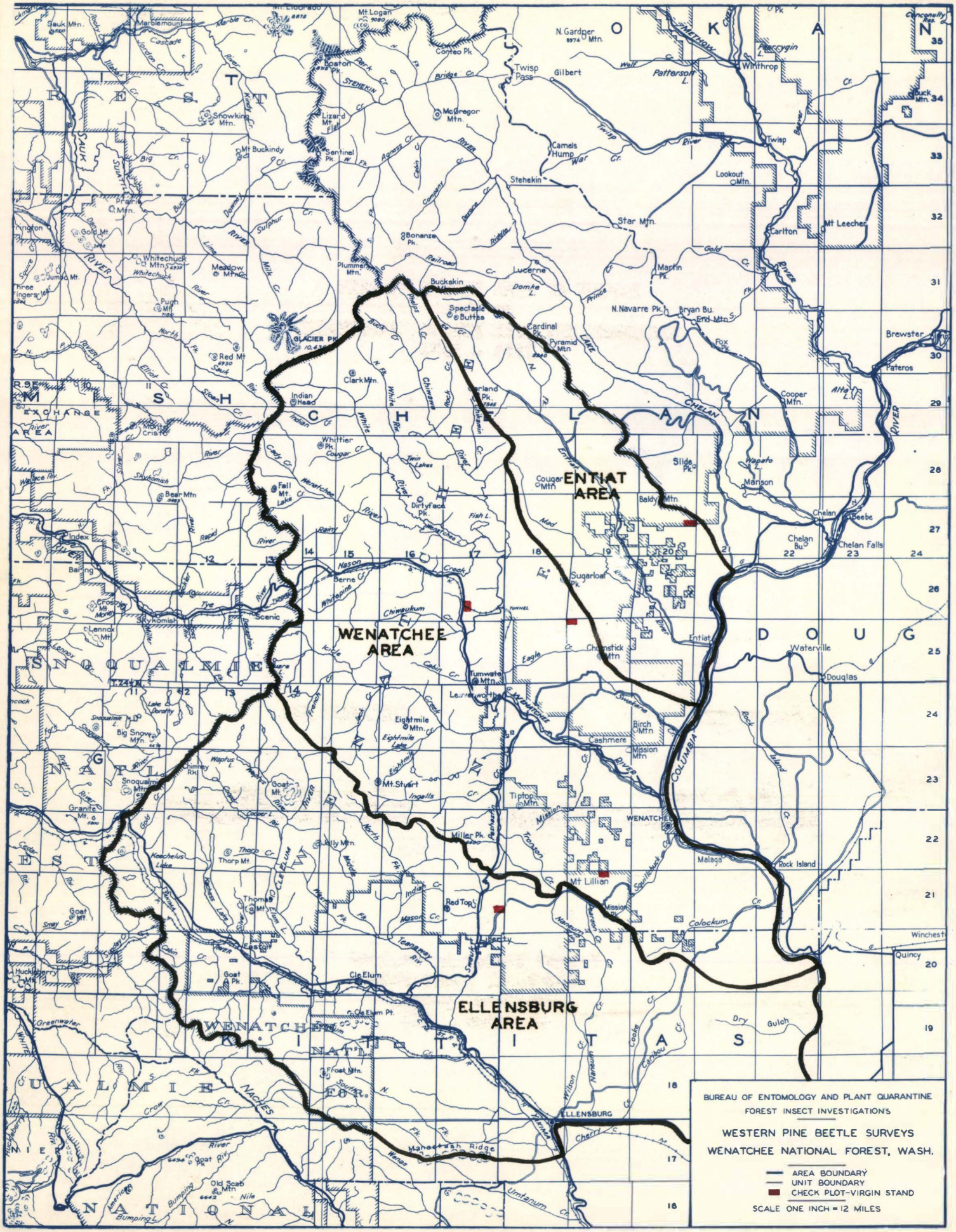
ENTIAT AREA
WENATCHEE AREA
ELLENSBURG AREA
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT INVESTIGATIONS
WESTERN PINE BEETLE SURVEYS
WENATCHEE NATIONAL FOREST, WASH.
AREA BOUNDARY
UNIT BOUNDARY
CHECK PLOT-VIRGIN STAND
SCALE ONE INCH = 12 MILES

REPORT OF PINE BEETLE SURVEYS
on the
WENATCHEE NATIONAL FOREST, WASHINGTON
1931 - 1938

APPROVED BY:

F. P. Keen
Senior Entomologist, in Charge.

SUBMITTED BY:

J. M. Whiteside
Assistant Entomologist.

Forest Insect Laboratory
445 U. S. Court House
Portland, Oregon
December, 1938

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Introduction.

The first accurate records of the activities of the western pine beetle (Dendroctonus brevicomis Lec.) in the ponderosa pine stands of the Wenatchee National Forest were started in 1932 but completed in 1933. In the latter year, through the cooperative effort of the Forest Service and the Bureau of Entomology, two permanent half-section check plots were established and cruised. This was in keeping with (1) the extension of the annual pine beetle surveys, previously conducted in portions of the pine stands of Oregon and California, to several forests in the State of Washington east of the Cascade Mountains; and (2) the placing of these surveys on the Forest Service administrative studies program, thereby establishing them as an important phase of a major research project.

History of the Surveys.

The two check plots, one on the Entiat Ranger District, and the other on the Leavenworth Ranger District, were established and cruised by Dr. J. A. Beal, formerly with this laboratory, assisted by members of the Forest Service Ranger C. C. Carleton, Assistant Ranger E. Cliff, Mr. P. A. Brinson, and one temporary employee. Although these plots were not cruised in 1934, the losses for that year were recorded during the survey of 1935 by a crew composed of Messrs. D. L. Lynch (Crew Leader), H. Campbell, and S. Jones, employed through the office of the Regional Forester and technically directed by the Portland Forest Insect Laboratory. In 1936 these plots were cruised by Mr. R. L. Furniss of this office with the assistance of Messrs. P. K. Taylor, S. T. Moore, and F. M. Henderson of the Forest Service. The 1937 survey was conducted by a crew of five C.C.C. Student Assistants composed of Messrs. R. C. Grant (Crew Leader), J. B. Gabriel, R. E. Geoghegan, G. M. Feil, and E. A. Brackett, employed and directed in the same manner as the 1935 crew. They were directly supervised by Mr. W. J. Buckhorn of the Portland Laboratory. The 1938 surveys were made by a three-man crew consisting of Messrs. R. M. Ramstad (Crew Leader), S. C. Norman, and M. Wyman, employed and directed as were the 1935 and 1937 crews. They were directly supervised by the writer.

During the 1937 surveys five new half-section check plots were established and cruised in order to follow western pine beetle infestation trends on other portions of this forest, as well as to strengthen the basis for estimating insect-caused losses over the

forest as a whole. Three of these plots were located in the Wenatchee Area and one each in the Entiat and Ellensburg Areas. In 1938 two of these plots were abandoned, making a total of five half-section plots upon which to base loss estimates. For the location of the plots cruised in 1938, see the frontismap.

In addition to the intensive check plot cruises, the western pine beetle situation on this forest has been followed by extensive or observational surveys. In 1936, Mr. Furniss made an observational survey of the general insect conditions. During the period of September 21-23, 1937, the writer traveled over many roads through the pine type and visited several fire lookout stations in order to supplement the actual plot data and to become acquainted with the western pine beetle situation in general. Similar trips in other portions of the forest were made this year during the same period. The pine stands in the following drainages have been examined: Entiat River, Icicle River, Eagle Creek, Van Creek, Peshastin Creek, Squillchuck Creek, and Caribou Creek. The Big Hill, Junior Point, and Mission Peak fire lookout stations were visited during these trips.

A summary of these western pine beetle surveys, together with the estimated losses for the Wenatchee National Forest as a whole since 1931, is herein presented.

Description of the Wenatchee National Forest.

The Wenatchee National Forest occupies the approximate geographic center of the State of Washington. The forest boundaries extend from the summit of the Cascade Mountains to the breaks of the Columbia River, and from Chelan Ridge, south of Lake Chelan, to the divide between the Yakima and the Naches Rivers. The forest embraces a gross area of 1,400,000 acres, of which approximately 35 percent is privately owned, mostly as railroad grant land acquired by the Northern Pacific Railroad Company under early land grants.

From an entomological standpoint, the ponderosa pine stands of the Wenatchee National Forest, together with those of all other ownership classes within and adjoining this forest, have been divided along natural topographic lines into three Areas. That portion of the forest in Chelan County has been separated into the Entiat and Wenatchee Areas, while that portion in Kittitas County comprises the Ellensburg Area. (See frontismap.)

Data obtained from the inventory phase of the Forest Survey [1,2/] show that there are approximately 544,000 acres and 2,529,000 M board feet of commercial ponderosa pine included in all ownership classes within these three areas. Of this volume, approximately 1,400,000 M board feet are in types in which western pine beetle losses have been the heaviest. The division of these pine stands by areas is shown in Table No. 1.

Table No. 1

Ponderosa Pine Distribution by Areas

Area	Acres of Merchantable Pine	Volume of Merchantable Pine M.b.m.	Volume of Pine Likely to be Affected by Bark Beetles, M.b.m.
Entiat	114,000	470,000	300,000
Wenatchee	230,000	956,000	600,000
Ellensburg	200,000	1,103,000	500,000
Total	544,000	2,529,000	1,400,000

Infestation Data, 1931 to 1937.

A tally of the standing ponderosa pine snags on the original plots at the time of their establishment indicated that the western pine beetle had caused rather heavy losses prior to 1931. From 1931 to 1933 these losses were of epidemic proportions, reaching a peak in 1932, when the two plots showed an average loss of 2.76 percent of stand, or 223 board feet per acre. Since 1933 the losses have been endemic in character, reaching their lowest point in 1936, when an average of .15 percent or stand, or 12 board feet per acre, was killed on both plots. The losses increased very slightly in 1937, but still represented a low normal or endemic condition.

1/ Bolles, W. H. 1937. Forest statistics for Chelan County, Washington. Pacific Northwest Forest and Range Experiment Station Report.

2/ Buell, E. D. 1937. Forest statistics for Kittitas County, Washington. Pacific Northwest Forest and Range Experiment Station Report.

A tabulation of the check plot cruising data by plots is given in Table No. 2. The infestation trends on the two older plots are shown in Chart No. 1. In Table No. 3 these cruising data are summarized for all plots as well as for the one plot having a continuous record. The mean infestation trend on these plots is shown graphically in Chart No. 2.

Infestation Data, 1938.

The current surveys were made during the period of August 30 to September 7, at which time approximately 50 to 55 percent of the probable losses on these plots were spotted and recorded. The losses estimated for 1938, based on these partially completed surveys, are considerably higher than the actual 1937 mortality on all except the Leavenworth plot. The largest number of trees spotted and estimated for 1938 was on the Entiat plot. In spite of this probable increase, the activity of the western pine beetle still represents a normal or endemic condition.

In Table No. 4 a comparison is made between the number of trees spotted on the check plots during the 1937 and 1938 surveys.

Table No. 4

Number of Trees Spotted on Check Plots
Wenatchee National Forest, Washington

	1937 Loss		1938 Loss		
Area and Plot	Spotted at Time of First Cruise	Total Spotted	Spotted at Time of First Cruise	Total Estimated	Remarks
Entiat Area					
Entiat	8	17	22	44	Increase 159%.
Wenatchee Area					
Leavenworth	3	14	8	16	Increase 14%.
Winton	1	2	5	10	Increase 400%.
Mission Creek	4	9	9	16	Increase 78%.
Ellensburg Area					
Liberty	3	7	15	26	Increase 262%.
TOTAL	19	49	59	112	Increase 129%.

In order to obtain estimate of the 1937 western pine beetle losses throughout the pine types of Region 6, the number of trees killed during last year was estimated on a per-section basis. The results of these estimates, and the status of the western pine beetle on the Wenatchee National Forest during 1937 are shown on the 1937 Infestation Map.

Estimated Losses for the Wenatchee National Forest as a Whole, 1931-1938.

As a result of the intensive check plot and general observational surveys, an estimate has been prepared of the pine beetle losses on the three areas comprising this forest. These estimates of the gross loss together with the tentative 1938 losses are given by areas in Table No. 5 and summarized for the forest in Table No. 6.

Summary and Recommendations.

Cooperative surveys conducted by the Forest Service and the Bureau of Entomology and Plant Quarantine, in order to follow western pine beetle infestation trends, were started on the Wenatchee National Forest, Washington, in 1932; and, except for 1934, they have been made annually. A tally of the standing ponderosa pine snags in 1932 and 1933 showed that the losses caused by this beetle had been of epidemic proportions during the preceding five-year period. Since the extremely cold winter of 1932-1933, when the pine beetle population was materially reduced, these losses have represented a very low or sub-normal endemic condition. Although the partially completed surveys of 1938 indicated that losses had increased rather sharply over those of the previous year, no control measures are warranted on this forest.

During 1939 both intensive check plot and general observational surveys should be made over the same areas on the Wenatchee National Forest.

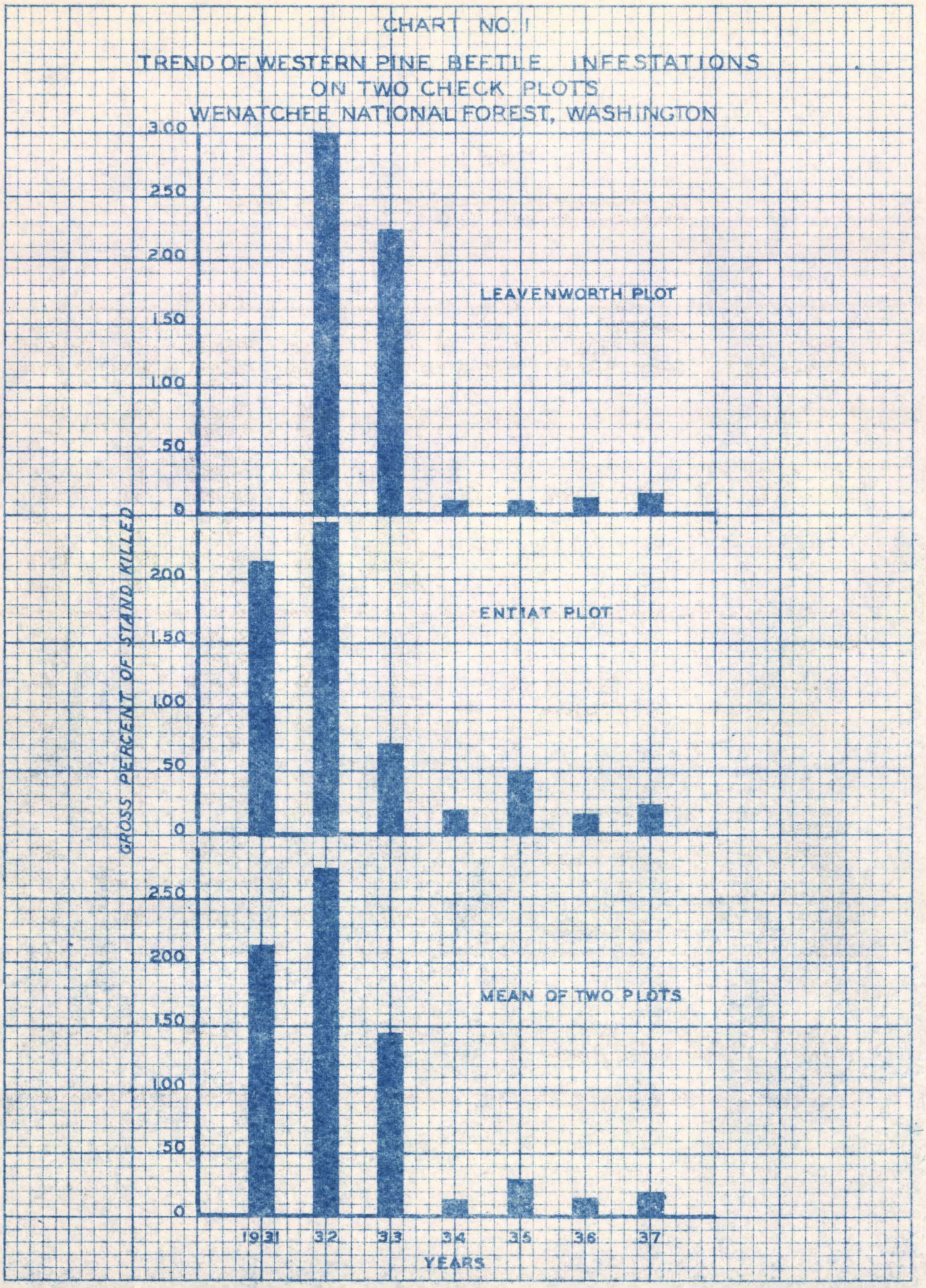


CHART NO. 1
TREND OF WESTERN PINE BEETLE INFESTATIONS
ON TWO CHECK PLOTS
WENATCHEE NATIONAL FOREST, WASHINGTON
GROSS PERCENT OF STAND KILLED
3.00
2.50
2.00
1.50
1.00
.50
0
LEAVENWORTH PLOT
2.00
1.50
1.00
.50
0
ENTIAT PLOT
2.50
2.00
1.50
1.00
.50
0
MEAN OF TWO PLOTS
1931
32
33
34
35
36
37
YEARS

Table No. 2

Annual Ponderosa Pine Mortality on Check Plots
Wenatchee National Forest, Washington

Area and Plot Location	Pine Timbered Acres and 1931 Stand Volume	Site	Losses				
			Year of Attack	Trees Killed	Volume Killed	Bd.ft. per Acre	Gross Percent of Stand
ENTIAT			1931	116	56,180	175	2.16
			1932	112	63,580	198	2.44
Entiat			1933	33	18,390	58	.71
T.27N, R.20E,	320		1934	9	5,290	17	.20
Sec. 13S½	2,600 M.b.m.	5	1935	26	12,800	40	.49
			1936	13	4,330	13	.16
			1937	17	4,430	14	.17
			Total	326	165,000	515	6.33
			Mean	47	23,600	73	.90
WENATCHEE			1932	171	78,880	246	3.02
			1933	136	57,060	178	2.23
Leavenworth	320		1934	19	2,890	8	.11
T.25N, R.19E,	2,570 M.b.m.	4-	1935	17	2,830	8	.11
Sec. 6N½			1936	11	3,260	10	.13
			1937	14	6,440	20	.25
			Total	368	151,360	470	5.85
			Mean	53	23,050	67	.83
Winton	320						
T.26N, R.17E,	1,800 M.b.m.	5	1937	2	1,430	4	.08
Sec. 28E½							
Mission Creek	320						
T.21N, R.19E,	2,150 M.b.m.	4-	1937	9	3,500	11	.16
Sec. 3N½							
ELLENSBURG							
Liberty	320	4	1937	7	7,180	22	.29
T.21N, R.17E,	2,500 M.b.m.						
Sec. 24N½							

CHART NO. 2

SUMMARY OF WESTERN PINE BEETLE LOSSES
MEAN OF TWO PLOTS
WENATCHEE NATIONAL FOREST, WASHINGTON

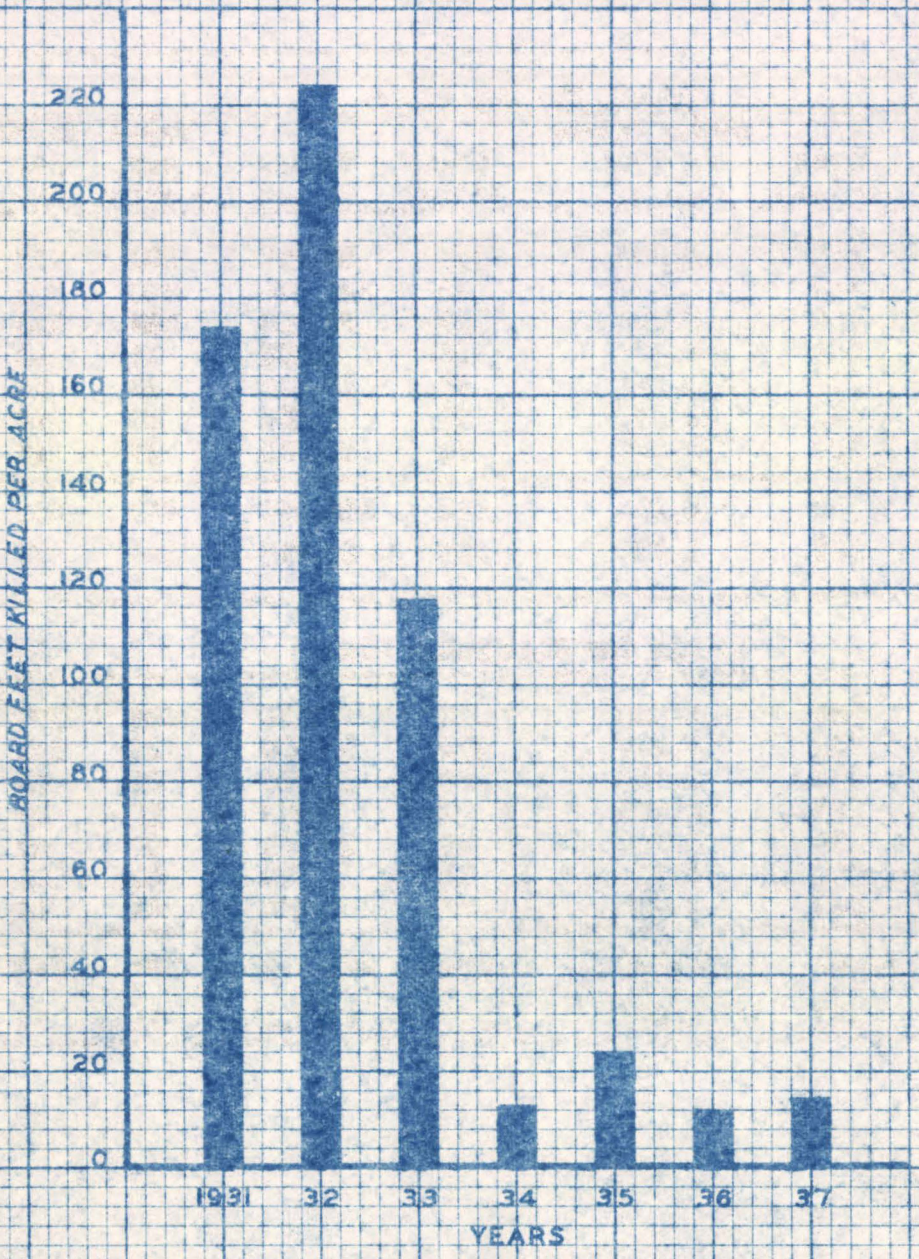


Table No. 3

Summary of Check Plot Cruising Data
Wenatchee National Forest, Washington

Totals for All Plots

Year of Attack	Number of Plots	Acres Cruised	Stand Volume in 1931 M.b.m.	Trees Killed	Volume Killed	Trees per Section	Bd.ft. per Acre	Gross % of Stand Killed
1931	1	320	2,600	116	56,180	232	175	2.16
1932	2	640	5,170	283	142,460	283	223	2.76
1933	2	640	5,170	169	75,450	169	118	1.46
1934	2	640	5,170	28	8,180	28	13	.16
1935	2	640	5,170	43	15,630	43	24	.30
1936	2	640	5,170	24	7,590	24	12	.15
1937	5	1,600	11,620	49	22,980	19	14	.20
Total	16	3,520	40,070	712	328,470	798	579	7.09
Mean	2.3	503	5,730	102	46,920	104	83	1.01

Totals for Continuous Plots

1931	1	320	2,600	116	56,180	232	175	2.16
1932	1	320	2,600	112	63,580	224	198	2.44
1933	1	320	2,600	33	18,390	66	58	.71
1934	1	320	2,600	9	5,290	18	17	.20
1935	1	320	2,600	26	12,800	52	40	.49
1936	1	320	2,600	13	4,330	26	13	.16
1937	1	320	2,600	17	4,430	34	14	.17
Total	7	2,240	18,200	326	165,000	652	515	6.33
Mean	1	320	2,600	47	23,600	91	73	.90

Table No. 5

Ponderosa Pine Mortality on the Wenatchee National Forest
By Areas, 1931-1938

ENTIAT AREA — Acres of merchantable pine - 114,000.
Volume of pine likely to be affected by bark beetles, 300,000 M.b.m.

Year of Attack	No. trees Killed	Volume Killed M.b.m.	Gross % of Affected Volume
1931	15,600	8,000	2.5
1932	17,500	9,700	3.0
1933	8,500	4,500	1.5
1934	2,300	1,400	.5
1935	3,000	1,800	.6
1936	4,500	1,500	.5
1937	4,200	1,200	.4
Total, 7 years	55,600	28,000	9.0
Mean, 7 years	8,000	4,000	1.3
(Tent.) 1938	2,000	1,500	.5

WENATCHEE AREA — Acres of merchantable pine - 230,000.
Volume of pine likely to be affected by bark beetles, 600,000 M.b.m.

1931	16,500	7,500	1.2
1932	24,500	11,300	1.8
1933	15,100	6,300	1.0
1934	8,000	1,200	.2
1935	8,500	1,800	.3
1936	5,500	1,200	.2
1937	6,000	1,800	.3
Total, 7 years	82,100	31,000	5.0
Mean, 7 years	11,700	4,500	.7
(Tent.) 1938	4,500	2,400	.4

ELLENSBURG AREA — Acres of merchantable pine - 200,000.
Volume of pine likely to be affected by bark beetles - 500,000 M.b.m.

1931	11,400	5,500	1.0
1932	16,000	8,000	1.5
1933	9,600	4,200	.8
1934	5,200	1,900	.4
1935	2,500	1,500	.3
1936	3,000	1,000	.2
1937	4,600	1,500	.3
Total, 7 years	52,300	23,600	4.5
Mean, 7 years	7,500	3,400	.6
(Tent.) 1938	3,500	1,900	.4

Table No. 6

Total Ponderosa Pine Mortality on the Wenatchee National Forest
1931-1937

Acres of merchantable pine--544,000.
Volume of pine likely to be affected by bark beetles - 1,400,000 M.b.m.

Year of Attack	No. trees Killed	Volume Killed M.b.m.	Gross Percent of Stand Killed
1931	43,500	21,000	1.5
1932	58,000	29,000	2.2
1933	33,200	15,000	1.1
1934	15,500	4,500	.3
1935	14,000	5,100	.4
1936	11,000	3,700	.2
1937	14,800	4,500	.3
Total, 7 years	190,000	82,600	6.0
Mean, 7 years	27,200	11,400	.9
(Tent.) 1938	10,000	5,800	.4

1938 PINE BEETLE SURVEY OF PONDEROSA PINE IN OREGON AND WASHINGTON

ENTIAT, WENATCHEE, ELLENSBURG, INFESTATION AREAS
WENATCHEE N.F., WASHINGTON

LEGEND

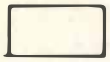
AREA BOUNDARIES

UNIT BOUNDARIES

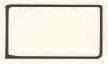
1937 BEETLE LOSS

0-25 trees per section. Normal infestation. Roughly about 0 to 1/4 of one percent of stand volume.

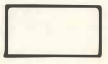
25-50 trees per section. Normal infestation. 1/4 to 1/2 of one percent of stand volume.



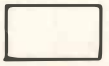
50-100 trees per section. Light epidemic infestation. 1/2 to 1 percent of stand volume.



100-200 trees per section. Moderate epidemic infestation. 1 to 2 percent of stand volume.



200-400 trees per section. Heavy epidemic infestation. 2 to 4 percent of stand volume.



Over 400 trees per section. Very heavy epidemic infestation. Over 4 percent of stand volume.

PONDEROSA PINE TYPES

Solid colors. Stands containing more than 50% ponderosa pine and of average or better thrift and vigor. In these stands the western pine beetle is the chief tree-killing agent.

Cross-hatched colors. Stands containing from 20-50% ponderosa pine.

Dotted colors. Ponderosa pine stands of marginal or fringe type. In many of these areas drought as well as insects is an important tree-killing factor.

Cut-over areas.

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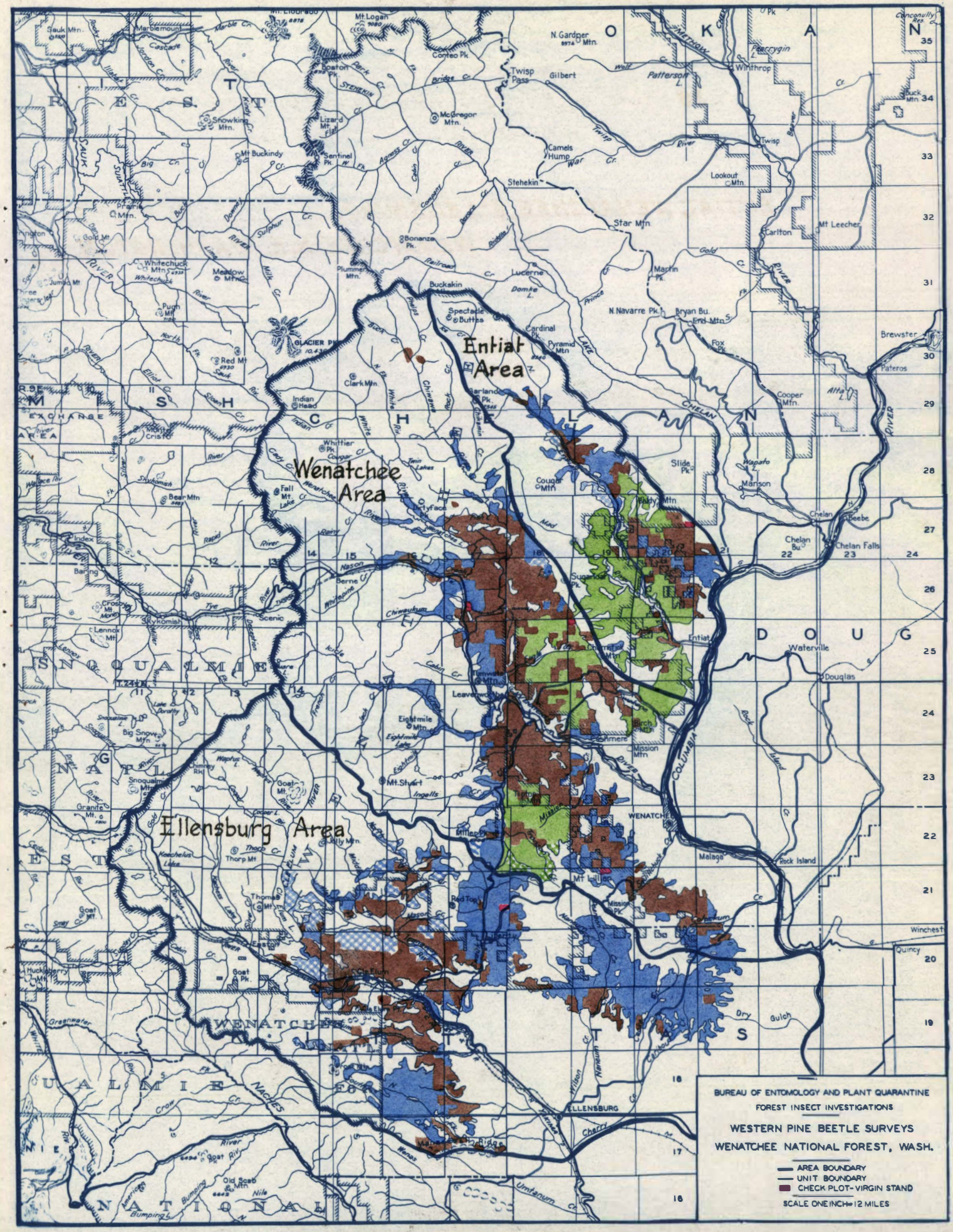
U. S. FOREST SERVICE
Portland, Oregon


Entiat Area
Wenatchee Area
Ellensburg Area
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
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